Application #9901 - United Industrial Services Ltd.
May 2000

Peace River Silica Sand Operation
Alberta Silica Corporation

NRCB
Natural Resources
Conservation Board

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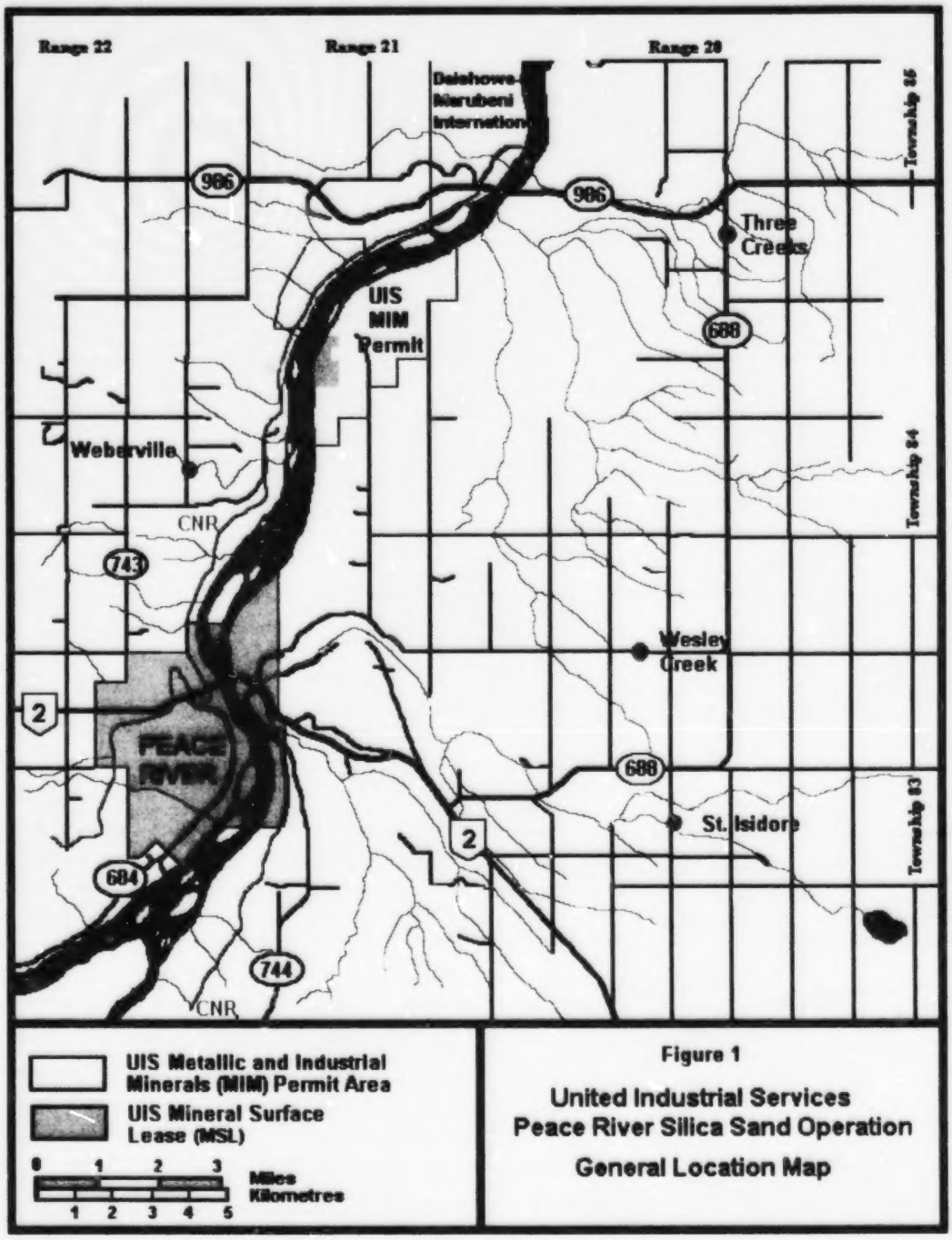

Figure 1

United Industrial Services
Peace River Silica Sand Operation
General Location Map

1. INTRODUCTION

1.1 NRCB Mandate

The *Natural Resources Conservation Board Act* (the *NRCBA*) enables an impartial public process to review projects that will or may affect the natural resources of Alberta in order to determine whether, in the Board's opinion, the projects are in the public interest, having regard to the social and economic effects of the projects and the effect of the projects on the environment. A reviewable project cannot commence unless the Natural Resources Conservation Board (NRCB or Board) has granted an approval for the project. The *NRCBA* requires a review of a project to construct a mine or quarry to recover any metallic or industrial mineral as defined in the *Mines and Minerals Act* and for which an environmental impact assessment (EIA) report has been ordered.

The NRCB established a division of the Board consisting of Brian F. Bietz (Chair), M. Neil McCrank (Vice-Chair) and Cynthia A. Langlo (Acting Member) to consider the application.

1.2 Application

United Industrial Services Ltd. (UIS) filed an application with the NRCB on 12 November 1999, for approval to construct a silica quarry located approximately 10 km north of the Town of Peace River in northwestern Alberta (Figure 1). UIS has operated a pilot facility at the site, mining and processing quartz silica since May 1999. The proposed silica operation would be operated by Alberta Silica Corporation (ASC), a wholly owned subsidiary of UIS.

The application seeks approval to operate a commercial silica mining and processing operation involving:

- sand pit development and extraction activities;
- sand transportation and wet processing;
- intermediate stockpiling of products;
- dry processing and shipping; and
- reclamation activities.

Extraction, washing and sorting activities are conducted during the warm weather months at the rate of 150 tonnes/hour, while drying and shipping of sand products is proposed to operate throughout the year at the rate of 75 tonnes/hour.

UIS holds the following licences and permits related to this operation (Figure 2):

- Metallic and Industrial Minerals Permit #9393080332 (MIM Permit) for approximately 1,250 hectares (ha), principally on the east side of the Peace River. The permit grants the right to explore for metallic and industrial minerals within the described lands. In order to produce silica from the area covered in the mineral permit, UIS would require mining and surface leases from the Crown in right of Alberta.

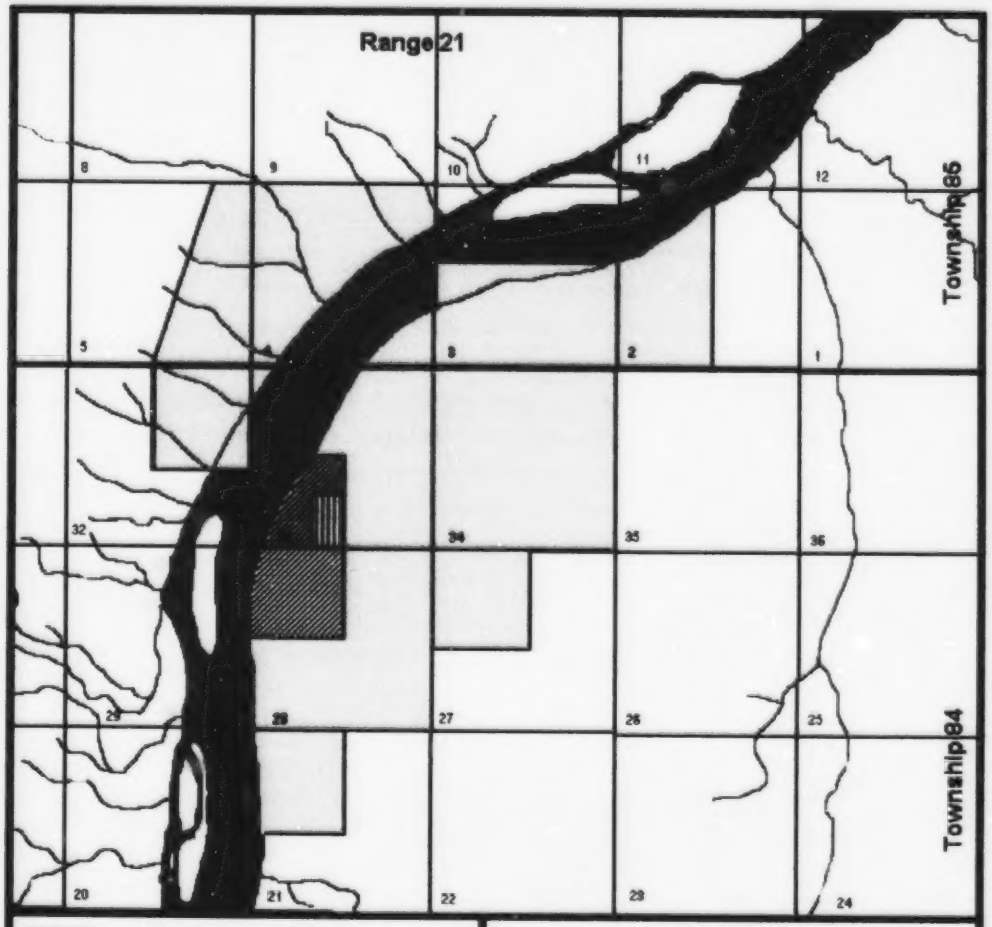

Figure 2

United Industrial Services
Peace River Silica Sands Operations
Location of Mineral and Surface Dispositions

- Metallic and Industrial Minerals Lease #9496110001 (MIM Lease) including the right to "win, work and recover the Leased Substances" over a 60 ha parcel located entirely on the east side of the Peace River. Not all of the area will be used for sand extraction.
- Mineral Surface Lease #941817 (MSL) comprising approximately 92 ha including the right to occupy or disturb the surface in association with the project. The MSL lands include all the lands contained within the MIM Lease plus approximately 30 ha located immediately to the north of the MIM lease. A new MIM Lease would be required before mining activity could be conducted on the 30 hectares not currently contained in the existing MIM Lease.
- The total area covered in the five-year pit development plan is between six and 10 ha. The plant and stockpile areas comprise an additional approximately four ha.

1.3 Scope of Review

Neither the application to the Board nor the Environmental Impact Assessment (EIA) discloses any plans by UIS to conduct mining activity in the MIM permit area outside the MSL. UIS has stated any future development of mining activities on the west side of the Peace River would not occur for at least 30-40 years. Having regard for the information provided, the Board is unable to assess the environmental effects that would occur from mining activities outside of the MSL. For this reason, any approval issued by the Board would limit mining activities to the area contained within the current boundaries of the MSL on the east side of the Peace River. The Board concludes that it has enough information to consider the active mining operations within the 92-ha area described in the MSL.

UIS does not require NRCB approval for ongoing exploration activities within the MIM Permit area but the Board would strongly encourage UIS to continue consultation with potentially affected landowners to address their concerns.

1.4 Review Process

UIS filed an application with the NRCB on 12 November 1999. In order to ensure public awareness of the proposed operation, the NRCB published a Notice of Filing jointly with Alberta Environment (AENV) in the Peace River Record Gazette, Grimshaw Mile Zero News and Alberta Sweetgrass on 13 - 15 December 1999. Following independent reviews of the filed materials by the NRCB and AENV, a consolidated request for supplemental information was sent to UIS. The information requested was determined necessary to complete the statutory mandates of the NRCB and AENV. UIS filed the responses to the requested information on 1 March and 6 March 2000, thereby completing its application to the Board.

The NRCB review process is one component of a broader review process that provides for public involvement at various stages. Early in its review, the NRCB determined that the review of this project had the potential to be completed without the need for a public hearing. Inherent in this assessment was the understanding that the affected public had been made aware of the project and had had an adequate opportunity to familiarize themselves with potential project effects. A critical element of ensuring public awareness is the public consultation program conducted by

the proponent. After reviewing the description of the public consultation program in the initial application, the NRCB requested the proponent to conduct further work in this area. This work was completed prior to the issuance of the Notice of Hearing. UIS also committed to conduct ongoing consultation should it receive an approval.

The Board published a Notice of Hearing on 13 – 15 March 2000, after consulting with AENV concerning the completeness of the EIA and completing its own review. Section 8 of the *NRCBA* provides that the Board is required to hold a public hearing only if it receives a bona fide objection from a directly affected individual or group of individuals.

The Board received one statement of concern in response to the notice of hearing stating that the landowner was concerned about road dust and safety concerns associated with truck traffic. However, the individual preferred to have the concerns addressed outside of the NRCB hearing process. This matter is discussed further in Section 7.3 of this report.

1.5 Public Consultation

UIS employed a multi-stage consultation process that has evolved to reflect the expanding scale of its project and the associated approvals process. Consultation commenced three years ago when UIS first sought approval for its pilot-scale operation. At that time, UIS met with various local individuals and business associations to describe the project and solicit their opinions or concerns about the pilot-scale operation. According to the EIA, the only concerns related to noise and all parties were generally supportive of the project. UIS believes that stakeholders who may be affected by the project were identified during the development and operations of the pilot-scale project.

The second stage of consultation occurred during the preparation of the EIA in August 1999. UIS attempted to personally visit each of the 21 residences located along the truck route between the plant site and Secondary Highway 688. Direct contact was made with only eight landowners and, according to the EIA, no one had any concerns about increased traffic volumes. Letters were left at the other residences to explain what steps UIS would take to minimize the effects of increased truck traffic. No attempts were made to solicit comments on any aspects of the proposed silica plant, other than truck traffic.

UIS held an Open House to discuss the EIA and the project in Peace River on 22 February 2000. Notice of the meeting was provided in two local papers. According to UIS, very few people attended the Open House, and no objections were voiced.

UIS committed to undertake future consultation with the local municipal government (MD 131) and with the Peace River Economic Development Board. Such consultations will be done to maintain open communication and to provide additional opportunities for input into the project. Other meetings with stakeholders will be held when the need for such consultation arises.

1.6 The Regulatory Context of NRCB Reviews

AENV plays a key role in the NRCB review process through the development of the environmental assessment information that forms part of most applications. AENV's involvement occurs during the development of the EIA terms of reference, the review of the EIA in terms of completeness, and the participation of AENV in an NRCB hearing. In overseeing the EIA process, AENV also invites other government departments to participate to ensure the completeness of the EIA. For example, Alberta Infrastructure (INFRAS) has provided input on issues related to transportation.

AENV also has a significant role in relation to an NRCB approval. Section 9 of the *NRCBA* provides that the Board may grant an approval on any terms and conditions that it considers appropriate and particularly in those circumstances where a need is identified to achieve certain objectives. The rationale for any terms or conditions are to be set out clearly in the Board's decision.

The NRCB differs from many regulatory agencies in that it does not have an ongoing role in the regulation of the project or industry. As a result, the ongoing review and enforcement of conditions included in an NRCB approval is normally delegated to a provincial department that has an ongoing regulatory function. The Board is careful to identify the appropriate delegate, most commonly AENV, to oversee the successful implementation of those conditions.

Notwithstanding this delegation, the NRCB believes that it must also remain informed of the steps taken to implement terms and conditions. For this reason, the NRCB will include a reporting mechanism that keeps the Board current on issues related to this approval in order to monitor and protect the integrity of its decision.

In assessing the impacts associated with a reviewable project, the Board has regard for the regulatory environment governing activities associated with the project. For example, in this review, the Board found it very helpful to obtain an understanding of the rules associated with the mining and plant operation overseen by Alberta Human Resources and Employment (AHRE). The Workplace, Health and Safety division of AHRE ensures compliance with the *Occupational Health and Safety Act*, and associated regulations. In obtaining an understanding of the regulatory controls in place, the Board believes it is also in a better position to understand the potential of the operation to affect both the workforce and those who may find themselves on the plant or quarry site.

2. PROJECT NEED AND JUSTIFICATION

Views of the Applicant

The Applicant believes that demand exists for the silica product that will be produced from the project. Silica sand and silica flour have a variety of commercial applications, including frac sand, glass manufacturing, and golf course construction. The project would provide the sole Canadian source for frac sand used in the oil and gas industry.

Views of the Board

In considering the need for the project, the Board considers issues associated with the justification for the project as well as the closely associated issues of project viability and the

incremental or redistributive nature of the expected benefits from the project. The Board has given consideration to these matters, which are fundamental to the Board's determination of whether or not the application is in the public interest.

In assessing the effect on the Alberta economy for the silica sand, other than frac sand, the Board has not had a full opportunity to examine whether the impact would be incremental or redistributive. However, because the project would provide the sole Canadian source for frac sand used in the oil and gas industry, the economic impact for this product would be largely incremental.

3. A BASELINE FOR IMPACT ASSESSMENT

The assessment of environmental, social and economic impacts of a project requires a comparison of conditions anticipated with the project against conditions that would exist without the project, i.e. the baseline conditions. Any differences are attributed to the project and are described as the impacts of the project. Baseline conditions for proposed projects are defined in two parts: the current conditions that may be observed, and the future conditions that may be anticipated in the absence of the project.

The UIS application is unusual because the NRCB normally reviews projects before they are built. The UIS plant was constructed in 1999 to accommodate full-scale operations, although under a temporary pilot-scale approval from AENV. As such, few modifications will be needed to scale up production.

It could be argued that the impacts of the plant construction and pilot-scale operations are part of the baseline, because the facility has already been built. Under this interpretation, the impacts to be reviewed would consist solely of the effects of scaling up operations to full-scale production. Indeed, the direction in the EIA terms of reference to "...identify environmental disturbances from previous, existing or approved activities which are to be considered as part of the baseline conditions" could be interpreted that way. The alternative interpretation is that the impacts of the project are properly measured against the 'without the project' baseline regardless of when the assessment is done. The EIA terms of reference also ask the company to "...explain the environmental effects of the construction, operation, decommissioning and reclamation of its Peace River Silica Facility," which appears to demand a complete assessment of the facility, not just the expansion of existing operations.

Views of the Applicant

The ambiguities in the direction given to the company were reflected in its impact assessment. Although the company was clear in its view that its 'project' was nothing more than scaling up operations at the existing plant, the assessment did not reflect a consistent understanding of the baseline. In some areas, the company said there would be no additional impacts. In other areas, impacts of the existing plant were clearly included. Even when prompted to clarify its interpretation of the baseline, UIS demonstrated some confusion by responding with a comparison between states rather than a baseline: "The base case for the environmental assessment is the pilot-scale operation compared to the pre-pilot condition and land use."

Views of the Board

The Board has adopted the view that the assessment must consider impacts of both the construction and operation of the facility. For several reasons, the baseline for this assessment is the pre-development state.

First, the current review was undertaken because quarries of a certain size trigger a mandatory EIA under *AEPEA*[1] and because NRCB approval is required for 'metallic or quarriable mineral projects' for which an EIA has been ordered. The Board believes that larger quarries are included in the *AEPEA* mandatory EIA list because they warrant the level of scrutiny provided by the EIA process. The statutory requirement for the NRCB review is not affected by the temporary approval to operate the pilot-scale facility. The purpose of that approval was to allow the Applicant to prove its operating plans.

Second, the impacts of the construction of the full-scale facility have occurred and will not be altered by this retrospective review. However, the Applicant has repeatedly stated that it would shut down and remove the facility if NRCB approval was not forthcoming because the plant cannot be operated economically without approval for full-scale production. In effect, the alternative to full-scale operations is not pilot-scale operations; it is a return to something like the already-disturbed pre-development condition of the site, i.e. the 'without the project' baseline.

Finally, it became apparent during the course of the review that certain impacts of the plant will have to be resolved whether production expands or not. An NRCB approval would supersede the pilot-scale operating approval and would have to address all potential impacts of the project at its current and proposed operating levels. The Board has therefore reviewed the impacts of the existing operations and the proposal to expand production against the 'without the project' baseline.

4. ISSUES

The Board believes the issues to be considered with respect to the application are:

Environmental Issues (see Section 5)

- Air quality and human health effects
- Noise
- Groundwater
- Surface water discharge
- Soils, vegetation and reclamation
- Wildlife
- Cumulative effects

Operational Issues (see Section 6)

- Mine development and geotechnical stability

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[1] Schedule 1(b) of the *Mandatory and Exempted Activities Regulation* (AR 111/93) of the *Environmental Protection and Enhancement Act* makes an EIA mandatory for the construction, operation or reclamation of a quarry producing more than 45,000 tonnes per year.

Economic and Social Issues (see Section 7)

- Local economy
- Land use
- Transportation

5. ENVIRONMENTAL ISSUES

5.1 Air Quality and Human Health Effects

Views of the Applicant

The Applicant reported in the proposed terms of reference for the EIA that the "materials to be handled at UIS's pit are essentially inert" and that the process incorporated several design features to minimize point source and fugitive dust emissions. These features include: wet slurry transport of the mined sand from the excavation site to the washing and sorting facility; a wet size sorting process; slurry transport of product to stockpiles; a cyclone dust collector on the dryer; and a cartridge filter on the dry plant.

The EIA described the mined product as the crystalline quartz form of silica and referenced the 1987 International Agency for Research on Cancer (IARC) assessment of human health risks, stating, "Silica is not a proven carcinogen. Although there is sufficient evidence that crystalline silica is carcinogenic in animals, limited evidence is available to support carcinogenicity in humans."

The human health risk is primarily associated with respirable quartz silica particles less than 10 microns, which can penetrate deep into the lungs. In contrast, about 85 percent of the marketable silica products from this facility ranges from plus 40 mesh to 140 mesh sizes (about plus 420 microns to 110 microns, respectively). The balance of approximately 15 percent of the raw feedstock is captured in the fines recovery system (particles less than 140 mesh or 110 microns) of which two percent becomes trapped as flocculated sludge in the clarifier underflow. The remaining 13 percent of product fines (silica flour) is deposited in the open product stockpiles.

Three point sources of airborne particulates were identified: quartz silica dusts from the dryer and from the dry plant, and diesel exhaust from the power generators. Silica fines in the dryer exhaust gas are removed in a particle collection cyclone, with a capture efficiency (on model silica) of more than 98 percent for particles greater than 75 microns. The dry plant material handling system is maintained under negative pressure to reduce emissions and equipped with a cartridge dust collector.

UIS estimated that point source emissions of silica dusts would be less than seven tonnes per 100,000 tonnes of processed material. It was not possible to quantify additional fugitive dust releases from open product stockpiles and quarry operations. Five air-sampling measurements at three locations (including one background sample) detected various ambient concentrations for both silica and particulate concentrations as total (mg/m^3) and respirable mg/m^3.

In response to requests made by AHRE (18 January 2000) UIS has undertaken to complete a detailed assay of air quality. UIS has also indicated that dust monitoring could be implemented and reported as a condition of the NRCB Approval and recognized that mitigating measures may be required.

Views of the Board

The Board is aware that, in 1997, IARC revised its former 1987 classification of quartz silica from probable carcinogen (Group 2A) to carcinogenic to humans (Group 1). Furthermore, crystalline quartz silica is classified as a controlled product under the federal *Hazardous Product Act* and *Controlled Products Regulations* and also regulated provincially under the *Occupational Health and Safety Act* and *Chemical Hazards Regulation.* This is because certain crystalline forms of silica, such as quartz, are known to cause adverse human health effects via inhalation of airborne dusts. Silicosis and lung cancer have been documented in chronically exposed workers. Thus it appears that facility design, construction, start-up, and pilot operations have been conducted with incomplete knowledge of the hazards of quartz silica dusts and of the applicable occupational health and safety regulations.

In the Board's view, the preliminary site investigation of air quality impacts conducted under near-ideal weather conditions is insufficient to draw conclusions regarding the risk potential (or lack thereof) under typical full-scale operations. The extent to which respirable silica dusts could be liberated during routine mining operations or generated by abrasion/attrition mechanisms during processing and materials handling is currently unknown. While the reported cyclone capture efficiency for particles larger than 75 microns is over 98 percent for a model silica, the capture efficiency on process feed for the size fraction of concern, less than 10 microns, is unknown.

The environmental fate of fines released from point sources and/or fugitive emissions was not described by UIS, making it impossible for the Board to assess the potential for long-term onsite and offsite impacts as materials migrate via resuspension/redeposition processes. The Board notes that the highest wind speeds were reported from the north, west and southwest, such that dispersion and transport of silica would tend to move particulates offsite in a southeast direction.

While acknowledging the substantial merits of a wet process in reducing dust, the Board is concerned about the lack of information on key air quality issues related to ambient concentrations of respirable silica dusts, and the environmental fate of released silica dusts. The principles of sustainable development and public interest require consideration of both the social and environmental effects of a resource development project as well as the economic benefits. The Board believes that the health effects that could arise from uncontrolled chronic exposures to respirable quartz silica dusts are unacceptable. The Board concludes that the potential hazards must be fully identified (or demonstrated not to apply), and mitigations implemented as required under federal and provincial laws. The risks must also be clearly explained to any populations identified as at risk.

The Board accepts the Applicant's commitment to resolve all site-generated air quality issues and commends the efforts begun during the review process. The Board also notes that UIS was required by AHRE to submit an action plan by 28 February 2000 outlining plans for worker exposure air monitoring. AENV has subsequently indicated in its submission (Her Majesty the

Queen in Right of Alberta as Represented by the Minister of Environment, the Minister of Alberta Agriculture, Food and Rural Development and the Minister of Infrastructure) that ambient air quality issues would be addressed in site approvals under *AEPEA*. Therefore, the Board is prepared to accept that the required mitigation to be undertaken by UIS to address human health concerns (to the satisfaction of AHRE) and ambient air quality concerns (to the satisfaction of AENV) will result in negligible residual effects.

5.2 Noise

Views of the Applicant

As a result of the project review process, noise was determined to be a significant impact that could result from the UIS operation. Initial evidence concerning noise was provided as part of the EIA. The noise assessment provided by UIS showed that two types of noise measurements were undertaken:

- Average noise levels were determined at "the fence line" (100 metres from the dryer) for an extended period (4.5 hours) and were measured as an L_{eq}[2] of 105.6 dBA[3]. The operation of the dryer was determined to be the primary contributor to noise levels.
- A source screening, conducted for 12-minute intervals at various locations across the site, showed noise levels ranging between 76.8 and 87.3 dBA. No measurements were taken at the dryer because it was not operating at the time the source screening tests were conducted.

No noise measurements were taken at night, even though UIS is seeking approval to operate 24 hours a day. The impacts of these noise levels were then assessed in terms of effects on workers and effects on the local community.

To evaluate noise impacts on the local community, UIS adopted the Alberta Energy and Utilities Board (AEUB) 1994 guidelines[4] to determine a permissible sound level (PSL) for the facility. The daytime PSL was selected as 55 dBA, based on a baseline sound level of 45 dBA to reflect Category 2 conditions[5] with less than eight dwellings per quarter section and a daytime adjustment of 10 dBA. Although the fence line measurements for the silica sand operation significantly exceed 55 dBA, UIS noted that the nearest residences are located 1.5 kilometres east and are screened by existing tree cover, and no noise complaints have yet been received. Should noise complaints be received, UIS stated that it is prepared to measure offsite noise levels and undertake noise reduction strategies, either by erecting noise barriers at the edge of the site or by reducing the noise at source(s). With mitigation, UIS concluded that its operations would have no residual impacts on offsite noise levels.

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2 L_{eq} refers to the energy equivalent sound level and is an average weighted (single-number) representation of the cumulative acoustical energy measured over a specified time interval.

3 dBA is the decibel (dB) sound pressure level that is filtered through the A filtering network to approximate human hearing at low frequencies. A decibel (dB) is a unit of measure of sound pressure that compresses a large range of numbers into a meaningful scale.

4 Alberta Energy and Utilities Board. 1994. Noise Control User Guide G-38. This guide was subsequently updated in November of 1999.

5 Category 2 reflects conditions where dwelling units are more that 30 metres but less than 500 metres from heavily traveled roads and/or rail lines and are not subject to frequent aircraft flyovers.

In terms of impacts on workers at its facility, UIS initially concluded that occupational noise levels were within acceptable limits on the basis that hearing protection would be required for workers in the area for longer than one half hour. This conclusion was reconsidered, however, when it was determined that a "noise exposed worker" with hearing protection, as per the *Noise Regulation* (A/R 314/81 as amended) under the *Alberta Occupation and Health and Safety Act*, can only be exposed to sound levels of 105 dBA for half an hour per day. In the absence of source screening measurements of the dryer, UIS was not able to determine whether its employees would be classified as "noise exposed workers" and what levels of noise exposure would be permitted. AHRE subsequently directed UIS (18 January 2000) to submit an action plan to outline how monitoring will be done to determine noise exposure. UIS committed to undertake these studies and to insulate noise sources if noise levels are found to be excessive. Should onsite measures to reduce noise be adopted, UIS expected that offsite noise levels would also be reduced, thereby reducing any impacts on the adjacent community.

Views of the Board

The Board believes that, based on the limited amount of noise monitoring that was done, the silica sand operations could have a significant impact on both the local community and the project workforce unless appropriate mitigation measures are implemented. The Board infers that, in order to produce average fence line sound levels of 105 dBA, the dryer must be generating sound levels at source that are near or exceed the sound levels permitted under the Alberta *Noise Regulation*. In addition, the Board accepts the Applicant's use of the AEUB standards for assessing offsite noise impacts as reasonable, but does not accept the argument that a lack of public complaints means that these standards are being met.

The Board notes that AHRE is now dealing with the issue of onsite noise at the UIS operations and has requested that UIS submit an action plan to demonstrate how it will comply with that regulation, including audiometric testing of workers. The Board believes that, by complying with the *Noise Regulation* to the satisfaction of AHRE, UIS can mitigate problems with onsite noise impacts.

Solving the onsite occupational problem may not, however, address the problem of offsite noise, unless UIS undertakes to reduce noise levels at source. The Board believes that such noise reductions would benefit both UIS workers and the local community. The preference for reducing noise levels at source is also consistent with Section 2 of the *Noise Regulations* which requires that employers first take all reasonable steps to institute engineering, work practice or administrative controls and then rely on protective equipment for their workers to resolve any remaining noise concerns. The Board accepts and acknowledges UIS's undertaking to more fully evaluate noise levels and to ensure that these levels are consistent with the AEUB guidelines which, in this case, would allow a daytime Permissible Sound Levels of 55 dBA. Since UIS is seeking approval for night time operations, and no night time measurement of noise levels was undertaken, the Board's approval will prohibit night time operations (22:00 – 07:00) until UIS can demonstrate to the satisfaction of the Board that its comprehensive sound level meets the night time PSL of 45 dBA at the nearest residences on either side of the Peace River.

5.3 Groundwater

Views of the Applicant

A groundwater exploration program undertaken in 1999 in the eastern part of the MSL detected significant variations in the thickness of the saturated zone and in groundwater surface elevation. These variations were interpreted as indicators of fairly complex hydrogeological conditions at the site, consistent with known regional instabilities in the Peace River Valley causing slumping and landslides. Since future mining operations will extend below the groundwater surface, groundwater seepage control will be required to maintain geotechnical stability.

The EIA identified a number of direct and indirect groundwater impacts associated with mining operations as negative and irreversible but of low magnitude, duration and scope. De-watering during excavation (required to ensure geotechnical stability) would lower the water table in the immediate vicinity of operations, with potential for offsite impacts, and the exposure of previously saturated zones to air for extended times may cause changes in hydrogeochemistry, adversely affecting groundwater quality. Site activities would also introduce a risk of fuel or chemical spills which, if not captured, may cause contamination of surficial soils and groundwater.

The Applicant presented a number of considerations to support the Applicant's conclusion that the risks were manageable and that the residual impacts were acceptable, including:

1. Extensive groundwater dewatering is considered unlikely because the project area and silica sand operation do not intercept a major aquifer. Two tests for hydraulic conductivity obtained relatively low values of 1.1×10^{-7} to 2.1×10^{-6} metres per second (m/s). Based on these observations, UIS believed that draw down of the water table induced by mine dewatering is not expected to extend beyond several hundred metres. Because of the low hydraulic conductivity, the distances involved and the fact that wells are completed in different formations, the risk of project-induced impacts on adjacent water wells was considered very low.

   Furthermore, groundwater is not widely used by adjacent landowners and the two nearest identified active wells are approximately three kilometres (km) to the east of the MSL eastern perimeter. A tenant reported that a third domestic well in the same vicinity might be used in the future. UIS stated that the two nearest active groundwater wells were up-gradient of the mine site and completed in a separate zone.

2. A search of the AENV well-log database identified 15 wells and springs within the five km radius of the Regional Study Area (on the east side of the Peace River). Well depths range from eight to 64 metres (m) and while lithology descriptions were generally missing, the majority of wells were thought to be completed in the Quaternary sediments. Local aquifers are variously estimated as low yield (0.1-0.4 litres per second). The groundwater quality is already marginal for domestic use, being very hard with elevated levels of dissolved salts (sodium-calcium-magnesium-sulphate-bicarbonate regimes) and some metals (iron and manganese). While groundwater had been considered as a potential water supply for the silica operations, sufficient qualities and quantities were unavailable at the plant site.

3. The above-ground diesel tank is double-walled, thereby providing a measure of secondary containment.

The Applicant recommended development of an appropriate groundwater-monitoring network as part of project approval.

Views of the Board

The Board accepts the Applicant's view, in principle, that the risk of offsite groundwater impacts is low. However, the Board notes that the estimated radius of draw down of a few hundred metres may still extend beyond the MSL boundary as mining operations advance south, east and north over the life of the project. The lack of detailed onsite hydrogeological information combined with indications of complex regional hydrogeology does not support a firm conclusion regarding potential offsite impacts. The two hydraulic conductivity tests involved the removal of a relatively small volume of water and, as such, results are most likely indicative of conditions in the immediate vicinity of the test-well. The presence of fractures or other regional features may also affect groundwater flow estimates.

In the Board's view a practical groundwater protection and management plan is needed to ensure long term project viability, safe mining, and that neighbouring groundwater users do not suffer hardships. Based on the information available, it is also not clear how potential offsite impacts would be detected, attributed and mitigated if future neighbouring users were adversely affected. The EIA report offered no mitigation for impacts to neighbours' wells other than the observations that an alternative water supply would be required and that the low risk of occurrence might excuse further consideration.

The Board believes that, in the event UIS site operations are reasonably shown to have adversely affected groundwater quantity and/or quality, UIS would be responsible for mitigating the effects of its activities (such as, but not limited to providing an alternative water supply or compensation for loss-of-use). UIS would clearly *not* be responsible for mitigating any groundwater damages caused by other regional activities or natural climatic conditions.

In the Board's view it is the responsibility of the Applicant to obtain adequate information to detect and understand the effects of its activities on the environment and adjacent residents. However, the Board recognizes that there is limited hydrogeological information for the project area which may make the determination of cause-effect impacts more difficult.

The Board accepts UIS's recommendation to develop "appropriate groundwater monitoring" and will require that UIS plan and implement an ongoing site groundwater monitoring program, to the satisfaction of AENV, for the dual purposes of assisting with slope stability evaluations to ensure safe mining and providing early warning of potential impact to adjacent groundwater users. As part of the groundwater monitoring program, UIS shall inform potentially-affected offsite groundwater users of the planned groundwater monitoring program and disclose to them any observed anomalies immediately following detection.

With regard to groundwater contamination, the Board understands that UIS is using one double-walled above-ground storage tank for onsite diesel fuel storage. The storage tank volume is

61 cubic metres (m^3). In consideration of the fuel storage volume, physical siting and expected long life of the project, the Board will require that UIS shall, to the satisfaction of AENV, implement measures for spill control and containment including overfill protection, leak detection inspection, corrosion/weathering protection, and protection against mechanical damage (such as vehicle collision) for the diesel storage tank. Fuels (such as diesel and gasoline) that are stored in above-ground storage tanks are also regulated by provisions in the *Alberta Fire Code*, Section 4.3. The fuel storage tank must be registered with the Petroleum Tank Management Association of Alberta (PTMAA).

5.4 Surface Water Discharge

Views of the Applicant

The UIS project description, EIA and application to the NRCB each stated that there would be no discharges of industrial waste-waters to the Peace River and therefore no water quality impacts. On this basis, the Applicant did not evaluate possible environmental effects on Peace River water quality, fish and aquatic organisms. The Applicant also noted that the process-water system would be re-filled from the Peace River each spring.

In response to the Board's Request for Supplemental Information regarding the nature, method and frequency of site process water discharges and potential impacts, the Applicant confirmed that, in addition to periodic overflow from the runoff retention pond, process water *would* be discharged to the Peace River at the end of each summer operating season. Again, possible environmental impacts were not addressed.

The volumetric capacity for the site water containment system is approximately 3183 m^3, consisting of: a raw water storage tank (570 m^3), a fresh water storage tank (2080 m^3) and a retention pond (532 m^3). Two clarifiers provide an additional volume increment. UIS will annually discharge to the Peace River (via the existing retention pond, secondary and perimeter ditching, and storm-water outfall) all process waters recycled through seasonal sand-washing operations, together with any collected groundwater seepage and site runoff. In the Applicant's view, there would be no environmental impacts to the Peace River.

Views of the Board

The Board expects that much of the process water to be used by UIS will initially be of similar composition to the Peace River. However, the chemical composition, physical and aesthetic characteristics of process water are expected to deteriorate as a result of recycling, evaporative concentration, contact with oil and grease (process equipment), contact with diverse earth minerals, addition of groundwaters, and diverse biological and algal activity. Water quality parameters of potential concern include Total Dissolved Solids (TDS), Total Suspended Solids (TSS), pH, oil and grease, Biological Oxygen Demand (BOD), temperature, and other as yet unidentified variables. The Board notes that, while the current plant design has facilities to allow sampling for water quality (a gated culvert at the retention pond), there is no provision for effluent treatment should the need arise.

The Board is confident it is within the Applicant's ability to implement a timely resolution of the process-water discharge issue. The Board notes that the issue of industrial wastewater

monitoring and discharge, having emerged during the public review of the application, will be addressed by AENV in future site-operating approvals. The Board notes AENV's position that it "does not object to water being returned to the Peace River at the end of the excavation season provided it is done in a manner which does not affect water quality in the receiving stream."

Having regard for the volume and nature of the expected wastewater discharge and for the expected discharge limits, release rates and monitoring and notification requirements that could be imposed by AENV, the Board believes that potential impacts on the Peace River would be negligible. However, the Board will require UIS to submit to AENV an evaluation of any potential environmental impacts to the Peace River that might be caused by its industrial wastewater discharges *before* this year's pre-winter discharge. The report should describe any mitigation that AENV might require and include a schedule for any future monitoring.

The Board recommends that, in view of the larger-than-anticipated volume of water to be discharged at the conclusion of summer operations, UIS should also revisit the design of the ditching and outfall installations to address erosion concerns. Depending on the quantities and quality of recovered groundwater diverted to the process water cycle, UIS may also wish to address internal operability issues; use of this resource had originally been disqualified based on insufficient quality as well as quantity.

5.5 Soils, Vegetation and Reclamation

Views of the Applicant

Surface mining at the UIS site will entail removal of vegetation, soils and overburden to access the silica deposit in the Paddy Member. UIS said that it will recontour, reclaim and revegetate spent quarry areas as new areas are opened. Progressive reclamation will limit the total area occupied by the quarry at any time.

The company recognized that the feasibility of this approach depends on a supply of soils suitable for reclamation. A study to assess the availability and suitability of soils for reclamation showed that soils on the site are Orthic Regosols, characterized by shallow (less than 10 centimetres) Ah (i.e. topsoil) horizons. UIS also noted that the limited supply of topsoil is not adequate for reclamation and that soil quality also presents some difficulties. Surface soil quality for reclamation is limited by pH, texture, and in some locations, organic carbon. Subsurface soil suitability is limited by pH, stoniness, texture and consistency. Moreover, practical limits on stripping practices will make it impossible to avoid significant (50 - 100 percent) admixing of topsoil with subsurface layers. UIS proposes to amend the admixed salvaged soils with organic material (e.g. straw, manure) to improve fertility and water holding capacity. The company also provided a mitigation plan to deal with the impacts of soil stripping, stockpiling, and replacement.

The Peace River escarpments are subject to slumping, and recent observations by the company's consultants suggest that development activities at the site are already causing impacts to slopes on the escarpment. UIS recognized that slope stability must be addressed in the mining and reclamation plans to ensure a stable landscape for reclamation. It proposed to establish minimum setbacks to reduce the risk of further slope failure. UIS stated that it also understands

that erosion-prone sites, particularly on the escarpment, may require intensive reclamation practices, such as rip-rapping or geotextiles, and that frequent monitoring will be necessary to detect erosion until vegetation becomes established.

Approximately 75 percent of the MSL is currently covered in trembling aspen forest. Another 12 percent along the southern escarpment is grassland. The remainder includes deciduous-dominated mixedwood, deciduous shrublands, and sites already disturbed by industry. The ultimate goal of reclamation, as stated in the application, is a return to similar proportions of these vegetation types. However, UIS proposed to establish a ground cover using a native seed mixture and to rely on natural succession to reforest portions of the site.

Of two rare plants discovered in the study area, the turned sedge *(Carex rotrosa)* occurs downstream from the Applicant's water intake in an area that can be avoided without compromising the development. UIS proposes to establish a 40 m non-disturbance buffer zone to protect this rare plant. It will not be possible to avoid disturbing the other rare plant, the little-seed rice grass (*Oryzopsis micrantha*), and its habitat if pits are developed on the escarpment grassland, as proposed. UIS stated that it will attempt to transplant this species.

Views of the Board

The Board accepts UIS's undertaking to progressively reclaim disturbed areas and notes that progressive reclamation will minimize the area of active disturbance. However, the Board is not prepared to accept the proposal to limit reclamation to establishing herbaceous ground cover. Although aspen will encroach on the reclaimed sites by suckering and seed, assuming the soil preparation has been properly done, this process would take, according to the Applicant's consultant, 40 to 50 years. At that slow pace, the cumulative area deforested by the project would expand for many years, possibly throughout the life of the project. The Board believes the goal of reclaiming the site to roughly similar proportions of vegetation types as now exist can and should be accelerated by active reforestation. The Board will therefore require UIS to include the active reforestation of previously forested reclaimed sites in its conservation and reclamation plan, to the satisfaction of AENV.

With regard to rare plant species, the Board notes that much of the area that may ultimately be developed has not been surveyed to date. The Board agrees that monitoring and mitigation will be required. Specifically, the Board requires UIS, to the satisfaction of AENV, to undertake thorough rare plant surveys of the areas to be affected, to avoid rare plants where possible, and to design suitable mitigation where avoidance is not possible. The Board agrees with the company's proposal to protect the turned sedge by establishing a 40 m non-disturbance buffer zone between the water intake and the marsh. The Board is also prepared to accept the proposal to attempt transplanting of the little-seed rice grass, since this species cannot be avoided in developing the mine. Monitoring of transplants and/or seeded areas will be essential given the uncertain outcome. In addition, the Board recommends that UIS or its consultants arrange to provide a live type specimen of little-seed rice grass to the rare plant collection at the Devonian Botanical Gardens, if one can be spared.

The Board has carefully reviewed the measures proposed by UIS and its consultants to mitigate the potential impacts of the project on soils, vegetation and reclamation. In general, the Board agrees with the need for these measures and accepts the company's assessment of residual

impacts. The Board requires UIS to implement all of the measures outlined in Table 1. The Board understands that specific mitigation for soils, vegetation and reclamation will be described in the Applicant's Conservation and Reclamation Plan as required by *AEPEA* and approved by AENV. The Board also accepts UIS's commitment to assess the need for setbacks and equipment load limits to prevent escarpment slumping. Any restrictions indicated by that study must be incorporated into the Applicant's Conservation and Reclamation Plan.

5.6 Wildlife

Views of the Applicant

The Applicant's evidence concerning wildlife, which relied substantially on a review of the literature to enumerate species that might occur on the site and in the surrounding area, indicated that there is considerable potential faunal biodiversity. The application identified a large number of potential species that could occur on the site: 218 birds, five ungulates, 14 large to mid-sized carnivores, 26 small mammals, three amphibians and two snakes. Some of the larger mammal species were observed directly, including black bear, coyote, moose and mule deer. A browse and pellet survey confirmed and quantified ungulate use of the site, and breeding bird densities were also estimated.

The potential direct and indirect impacts to wildlife include direct mortality (road kills, nest disturbance), habitat destruction, habitat degradation and alienation (sensory disturbance and avoidance), and disruption of movement corridors. UIS proposed a series of mitigation measures to address these adverse impacts (summarized in EIA Table 1).

Views of the Board

The Board has carefully reviewed the measures proposed by UIS and its consultants to mitigate the potential impacts of the project on wildlife. The Board is prepared to accept the Applicant's assessment of residual impacts for the immediate future with the understanding that all of the proposed mitigation is implemented. The Board particularly wishes to emphasize the importance of restricting site clearing to late summer-early fall to avoid causing direct mortality of nesting birds and overwintering ungulates.

One measure described in the wildlife assessment, but not captured in Table 1 of the EIA, was the proposal to place signs where wildlife corridors intersect the truck route. The Board believes that the potential for direct mortality of ungulates as a result of increased truck traffic is a real issue. The Board recommends UIS work with provincial and municipal authorities to minimize the impact through signing, speed restrictions near corridor intersections, or other means.

Of the bird species known to breed on the MSL, three are recognized provincially as sensitive species[6] and are listed because their populations are in decline. Although the Board has no evidence before it concerning the cause of their population declines, it notes that two of the three species rely on mature Boreal forest. By avoiding direct mortality due to spring clearing and by

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[6] The Status of Alberta Wildlife, (Alberta Environmental Protection), 1996 describes 'sensitive species' as "species that are not currently believed to be at risk, but may require special management to address concerns related to naturally low populations, limited provincial distributions, or demographic/life history features that make them vulnerable to human-related changes to the environment."

restoring the aspen forest to reclaimed sites promptly, the Board believes that UIS can limit the damage done to these species by the project to an acceptable level.

Any conclusions with respect to the impacts of the project on wildlife must be tempered by an awareness of the limited site-specific data concerning the biotic resources potentially affected. A particular concern with the uncertainty over the presence and abundance of species is that an unrecognized local concentration of a regionally uncommon species or critical habitat could be adversely affected before it is detected. The potential for hibernacula mentioned in the EIA is a specific example. The Board notes that UIS has completed biological surveys for the area covered by the five-year mine development plan. In order to have adequate information before developing the mine outside of the area covered by the five-year mine plan, the Board will require that UIS, to the satisfaction of AENV, conduct biological surveys of sites slated for quarrying at least two years in advance of clearing to allow adequate time to adjust mine plans.

5.7 Cumulative Effects

Views of the Applicant

UIS submitted that existing and planned development along the Peace River valley is limited. However, it identified gravel pits, a pulp mill, and a water intake structure in the immediate vicinity of the development. For the five-year period of assessment, UIS believed that the impacts of the proposed project and the other existing projects in the area would not produce significant cumulative effects.

Views of the Board

The immediate environmental impact of quarrying includes the destruction of the affected habitat and a reduction in the value of adjacent habitat due to sensory disturbance. In the context of regional habitat destruction, particularly given the large areas already converted to agricultural lands, the area to be disturbed by this project, even after many years, is relatively small. The cumulative area affected by the project and by current and reasonably foreseeable industrial developments, taken as a whole, likewise represent a small part of the landscape in the next decade.

The Board has little evidence concerning the Applicant's longer-term mine development plan or the potential for industrial development in the surrounding region that would enable an assessment of cumulative effects in subsequent decades. This is of concern because the impacts of the project, which will be felt for the duration of the quarrying operation and for many years afterwards (see below), could ultimately interact with neighbouring projects to produce damaging cumulative effects.

For example, the current and reasonably foreseeable industrial development in the vicinity of the project does not appear likely to disrupt wildlife movement in the immediate future. Movement corridors mapped during the assessment skirt the development, likely reflecting the animals' accommodation of the industrial site. In the longer term, there is no guarantee that movement corridors will not be obstructed by UIS's expanding quarry operations and the nearby gravel pits unless the industries in the immediate area of the UIS site act jointly and deliberately to protect

them. UIS could take the lead in this stewardship by sharing the wildlife corridor information it has gained with neighbouring industries.

The habitat impacts of the project are also potentially reversible with careful reclamation and revegetation. As noted in Section 5.5, the Applicant's plan to progressively reclaim spent pit areas will limit the size of the active disturbance. The Board's requirement for active reforestation will also minimize the duration of the cumulative impacts of deforestation. However, it should be noted that even with the reclamation practices required by the Board, the duration of the habitat loss will be several decades for species specializing in mature aspen or mixed forest. The Board believes it is necessary to mitigate this adverse effect to the extent possible because the future capacity for development depends on limiting the cumulative effects of current developments.

The Board concludes that the cumulative impacts of the project on vegetation and wildlife habitat are acceptable in the immediate future provided the mitigation proposed in the Application is fully implemented. The area affected is relatively small and the impacts are reversible. Over the longer term, the cumulative impacts of the project in combination with other developments and activities in the area are less certain. The Board believes these potential impacts could be successfully managed by UIS if the company adopts a proactive approach to the assessment and design of biological mitigation as part of its mine development planning process. The Board will apply conditions to this approval with respect to ongoing surveys and monitoring for this purpose. Avoiding certain impacts, such as corridor blockage, will oblige UIS to coordinate with neighbouring industries and other users of the area to promote understanding and joint stewardship.

6. OPERATIONAL ISSUES

6.1 Mine Development and Geotechnical Stability

Views of the Applicant

The EIA provided a conceptual mine development plan for a five-year time frame, supplemented by a diagram showing the likely direction of pit development for nine years. The proven and probable reserve estimate is 13.9 million tonnes of dry silica sand from a silica deposit averaging 26.5 feet (eight m) in thickness. The Paddy Member is unconsolidated friable sandstone reported as being 99 percent pure quartz silica.

The Applicant indicated that a detailed twenty-year development plan is being developed for the MSL. Mine development is envisioned to be a sequential process, maintaining an active surface area footprint of about 15 ha at full-scale commercial operations. As excavation moves inland (southeast and northeast) from the Peace River, the overburden depth increases and mine depths may reach 50 m, limited by the need to maintain an economic stripping ratio of overburden/silica. The average ratio of overburden to silica is 3:1 and recovery may be economic up to a ratio of 5:1.

In two to three years, mining operations are expected to significantly intersect the Shaftesbury shale, a regionally unstable and potentially dangerous layer in the overburden. Long term, mine development is anticipated to remain within the 390 m contour line running northeast through the MSL, and this would preclude development on about one third of the MSL area in the southeast corner.

The EIA states that the two critical variables contributing to geotechnical instability of the proposed mine are the presence of a phreatic surface (groundwater), and the strength and orientation of slickensides within the Shaftesbury shale. Site hydrogeology is complex and there are significant variations in the level and location of saturated zones, as observed in three drill holes. Vertical and/or horizontal drainage wells may be required to improve stability.

The presence of slickensides was inferred, although tests were not performed to verify their presence or orientation. The EIA reported that the safety factor (derived from assumed pore pressure ratios) is marginal, such that a high, wide and steep wall in the Shaftesbury shale would clearly be unstable. The observational approach in conjunction with certain excavation controls was suggested as appropriate. In conjunction with the exploration drilling program, a geotechnical assessment should be performed to confirm the design assumptions.

Views of the Board

The design-life of the project was not explicitly defined for the MSL, but the proven and probable reserve estimate of 13.9 million tonnes of dry silica sand could support about 40 years of mining at UIS's proposed maximum production rate of 350,000 tonnes/year. This site clearly has the potential to support a significant, long-term enterprise.

In the Board's view, the lack of site-specific geotechnical information remains to be addressed. No evidence was provided to confirm that saturated portions of the Paddy Member could resist liquefaction or crumbling into quicksand induced by the vibration of heavy equipment mining the overburden. Sampling and testing for geotechnical strength parameters of the Shaftesbury shale was not conducted. Any incremental destabilizing effects of precipitation at the 1:10 year event were not assessed.

The Board notes that the observational approach is no longer the accepted normal mining practice in Alberta. For example, a large perched water table in sand ahead of mining, if undetected (and not de-watered or planned for), could cause the pit wall immediately ahead of mining to break and flow onto mining equipment. Depending on the size and elevation of the perched water table formation relative to mining, such a landslide could bury workers and equipment in its path. Observing such a failure after the fact would not mitigate potentially significant adverse effects.

The Board acknowledges the Applicant's undertaking to develop a twenty-year engineered pit plan and accepts this as required to ensure the orderly and efficient recovery of the silica resource. The Board will require that the Applicant shall, to the satisfaction of AHRE, conduct a geotechnical assessment and stability monitoring program in advance of excavation of the Shaftesbury shale to ensure viable mine plans, precautions and practices are developed and implemented, with regard for all relevant sections of the *Mines Safety Regulations*. This would

include the establishment and implementation of a plan of procedures, certified by a professional geotechnical engineer, for the safe control of mine walls.

The Board understands that the first site visit by a mines inspector (from AHRE) will result in a detailed review of all mine safety issues. The Board will require a written summary by 31 December 2000, describing how UIS will address all potential mining and geotechnical problems identified above, and achieve compliance with the *Mine Safety Regulations*.

7. ECONOMIC AND SOCIAL ISSUES

7.1 Effects on the Local Economy

Views of the Applicant

UIS believes that its project will have positive economic and social impacts on the local community. According to UIS, approval of the silica sand project to operate at full capacity will result in:

- continued seasonal employment of the existing workforce, which currently includes 15 local residents;
- expansion of the workforce to 20 jobs during peak summer operation;
- employment of three or four people for each of two shifts during the winter months; and,
- continued purchases of goods and services from local businesses on the order of about $3 million per year under full operation.

UIS stated that it has adopted policies to provide safety training for all employees, to offer skills upgrading for its employees, and to purchase goods and services from local businesses, even if it has to pay a premium to do so. The company notes that its project has the support of the Peace River Board of Trade, the Peace River Rotary Club, and the Peace River Economic Development Council.

Within a regional context, UIS indicated that its project would have a very small impact on the regional workforce, which it estimates to be on the order of 4,700 people. Consequently, UIS concluded that approval of the project would have no impact on the regional population, services or infrastructure.

In the longer term, UIS suggested that approval of their silica operations will ultimately attract spin-off industries that use silica as a raw material. These industries include glass manufacturing, fibre optics, and foundries. Although there are no plans for such development at present, UIS expects that the local community will be competitive with the rest of Alberta in attracting these types of industries.

Views of the Board

The Board accepts UIS's assessment of the impact of its project on the regional economy. Although the project is small, it will offer local residents some employment and business opportunities and, in the longer term, the silica plant may help catalyze regional economic diversification. However, this conclusion is predicated on UIS ensuring that its workforce and the surrounding community are adequately protected from exposure to silica dust or noise, as described above.

7.2 Land Use

Views of the Applicant

The UIS silica plant is located on the east side of the Peace River within the Municipal District of East Peace (MD 131). In its EIA, UIS suggested that the silica plant would have no impact on regional land use because operations would occur on lands that have been zoned by MD 131 to include a silica sands plant. This activity is a discretionary use under the MD's existing classification of the site as Rural Industrial District 2 (RM 2) and is also a discretionary use under the MD's proposed new zoning system, which would classify this site as a Natural Resource Extraction District 2 (RM 2). UIS notes that the Municipal Planning Commission may require that the site be screened from view with a vegetated buffer strip.

Although UIS provided no evidence on the actual land uses on adjacent properties, it did describe approved uses based on current and proposed zoning. Immediately north, south and southeast of the UIS lease, the land is currently zoned as a forestry district, but would be reclassified as an environmental/park reserve district under the revised zoning. These lands belong to the Alberta Forest Service. Based on future zoning, the purpose of this land is "to provide the public with an area for recreational activities and to protect areas which are environmentally sensitive." UIS indicated that its proposed operations must remain sensitive to the proposed designation, but offered no explanation of what this might mean.

Lands to the northeast of UIS are also classified as RM2 and are being developed as gravel pits by both MD 131 and Gladstone's Contracting. During the EIA process, Gladstone Contracting sought clarification of how its operations under SML 93055 will be affected by UIS, which will have to mine through Gladstone's SML to get to the silica sand underneath. In response, UIS indicated that its operations would not approach SML 93055 for about 20 years, at which time it would enter into negotiations to resolve any conflicts. UIS believed that joint development of SML 93055 would actually be beneficial, with UIS getting the silica sand and Gladstone getting the riprap. In the meantime, UIS and Gladstone have an agreement on the use of the approach road to the UIS lease site.

All other nearby lands on the east side of the Peace River are classified as Agriculture District 2 (A2). These lands serve as a buffer between intensive livestock development and areas of environmental significance, and are privately-owned. UIS believes that the only residual impact of its operations will relate to aesthetics, and it believes that these impacts will be minimized by progressive reclamation of its lease.

The only other land uses that may be of concern are recreation, which is permitted and may occur in all of the land use classifications, trapping, outfitting and hunting. Investigations by UIS indicate that there is no trapline in the area, there has historically been little outfitting in the study area, and there is low recreational or hunting in the area because of the existing sand and gravel operations. For these reasons, UIS believes that their silica sand operation will have no appreciable impact on these activities, except that no hunting will be allowed on the UIS leased lands. For safety reasons, UIS will place signage at the lease boundaries and will keep access gates locked when the site is not being used.

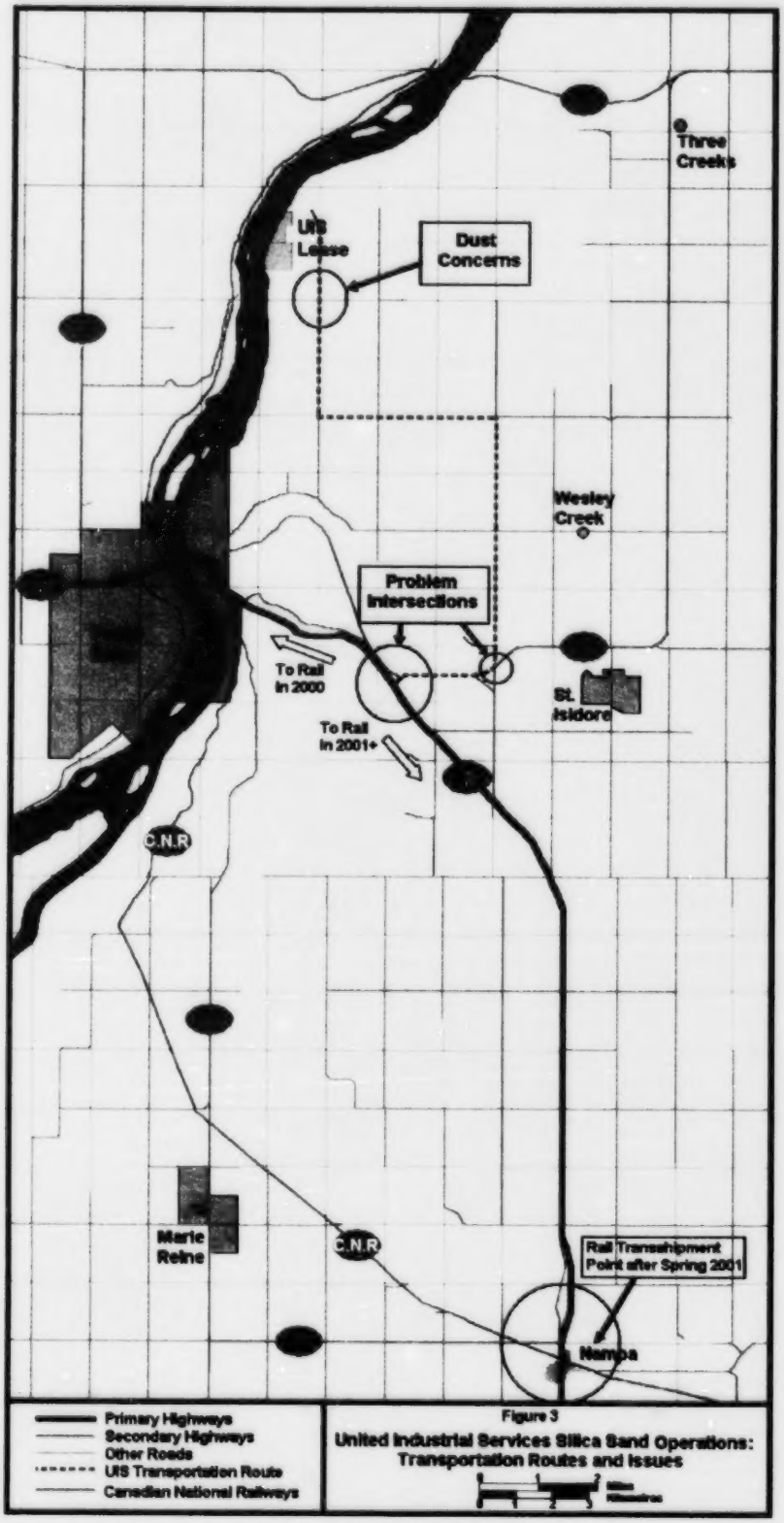


Figure 3
United Industrial Services Silica Sand Operations:
Transportation Routes and Issues

Views of the Board

The Board believes that UIS is aware of the adjacent land uses that may be affected by its operations and that UIS is willing to seek ways of resolving any land use conflicts that may occur. In order to screen the site from view and to help protect the adjacent environmental/park reserve lands, the Board recommends that UIS maintain a vegetated buffer strip around the perimeter of the lease. Such a buffer zone will also help dissipate noise from the operations and ensure that nearby landowners are not adversely affected by the operation.

7.3 Transportation

Views of the Applicant

Operation of the silica sand facility will have some impact on the regional transportation system. UIS intends to move silica products by truck to a transshipment point where the product will be transferred to railcars and then moved to market by train. In 2000, this transshipment point will be located north of the Town of Peace River, so that trucks carrying silica products will travel south on Secondary Highway 688 (SH 688), then north through the Town on Highway 2. In 2001 UIS intends to develop a permanent transshipment point in Nampa, some 20 kilometres southeast of Peace River. Under this scenario, trucks with silica product would again travel south on SH 688 but then proceed south rather than north on Highway 2.

According to UIS, about 30 trucks per day would be required to transport silica products if the facility were operating at full capacity. This represents about 60 vehicle movements per day. Based on recent traffic count information, UIS believed that this additional level of truck traffic would be insignificant. Average annual daily traffic (AADT) on SH 688 would only increase by about five percent, while AADT on Highway 2 either north or south of Peace River would increase by between two and three percent. UIS contended that both SH 688 and Highway 2 are in good condition and would not require upgrading to accommodate the additional truck traffic.

UIS recognized that the additional truck traffic will have a more significant impact on the gravel roads between the plant and SH 688. In terms of road wear, UIS has negotiated an agreement with MD 131 for any additional maintenance, and also has an agreement that will allow trucks to operate at full weight capacity year round (ie. no seasonal weight restrictions). There is also some concern about the adequacy of the intersection between RR 205 and SH 688 to handle large trucks like "B-Trains" but, according to UIS, this intersection is to be upgraded during the 2000 construction season.

In terms of noise effects, UIS will require its truck operators to comply with a 70 kph speed limit on Secondary Highway 688 and all other MD roadways. Furthermore, UIS has committed to restricting truck speeds to 30 kph along those sections of road where noise or dust are issues, and will not use engine retarder brakes. UIS does not anticipate any additional dust control measures at this time. However, it is working with MD 131 to try to secure funding to upgrade the rural roads that will be used to haul its products. To help address the impacts of trucking, UIS has erected signage to help ensure that truckers follow the prescribed transportation route to minimize dust and noise impacts.

Some concerns about dust and noise did arise as part of early public consultation efforts, but UIS believed that these concerns had been addressed.

Views of Interveners

Two interveners expressed concerns about project impacts on transportation. First, INFRAS raised concerns about the intersection of Highways 2 and 688 to safely accommodate the additional truck traffic. INFRAS is concerned that the acceleration and deceleration characteristics of loaded vehicles turning at this intersection may pose a public safety risk, especially when the transshipment point changes to Nampa. In response to this concern, UIS committed, by way of a letter dated 28 March 2000, to undertake an engineering assessment of the intersection configuration to determine what, if any, upgrading will be required.

Landowners living south of the UIS plant and adjacent to the road raised a second concern related to increased traffic. They reported that the increased traffic along this road has already resulted in a significant increase in road dust, which affects their hay fields, pasture and ultimately the health of their horses. They indicated that increased traffic and road dust has also restricted their ability to ride their bicycles and horses around their property. They also believe that the additional road traffic has influenced the value of their property and that this concern is shared by other nearby landowners. In their minds, resolution of these problems could involve the MD implementing a more rigorous dust control problem, but the preferred solution would be to have the MD pave the road, without this affecting their property taxes.

UIS has responded to this complaint by noting in a letter dated 28 April 2000 that, although it is only responsible for a portion of the truck traffic, it will continue to work with the MD to find a permanent solution to the dust problem and, in the meantime, maintain a 30 kph speed limit to reduce dust levels in areas where dust or noise are a local concern.

Views of the Board

The Board is pleased that UIS has been working with the provincial and municipal governments to resolve potential transportation issues in advance of full-scale operations. Having reviewed the analysis by UIS, the Board is concerned that the estimates of increased traffic did not appear to include travel by UIS employees or companies providing services to the plant, such that the daily traffic movements associated with the project could be twice as large. However, provided UIS continues to work effectively with MD 131, INFRAS and adjacent landowners to address transportation related problems, the Board is prepared to accept that any future issues related to safety, dust, noise or maintenance can be addressed.

8. DECISION

Having regard for the information provided, the Board was unable to assess the environmental effects that would occur from mining activities outside of the MSL. For this reason, any approval issued by the Board is limited to mining activities within the boundaries of the current MSL (#941817) on the east side of the Peace River.

The Board has reviewed the outstanding issues associated with the UIS application, as presented in Section 4 and discussed in Sections 5, 6 and 7. The Board has also considered the opportunities for mitigation and the resulting residual effects that would occur should the project proceed. When these residual impacts are balanced against the project's benefits to society, the Board concludes that the project is in the public interest.

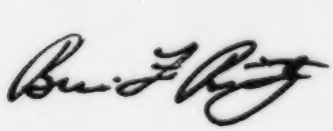
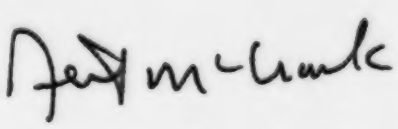
In reaching this conclusion, the Board has given significant weight to the Applicant's proposed mitigation measures. Table 1 lists those mitigation measures described in the EIA. The Board's approval is contingent upon the Applicant fulfilling its commitments to the mitigation measures detailed in its entire application, which consists of the EIA and supplementary information filed with the Board. The Board has also identified a number of additional mitigation measures that will help ensure the project's residual impacts are minimized, and these measures have been specified as conditions in the Form of Approval.

The Board realizes that there are intrinsic uncertainties associated with any resource development project. Through its pilot operations, the Applicant has acquired some practical understanding of the types of uncertainties that may be encountered in future operations of the project. As UIS gains more operating experience, the Board expects that additional opportunities for enhancements or refinements may arise. The Board encourages UIS to explore such opportunities for enhanced mitigation as they emerge. The Board commends the Applicant's commitment to ongoing dialogue with the local community and expects full cooperation with the relevant regulatory bodies regarding monitoring, and implementing or altering required mitigation.

The Board has carefully considered all of the evidence pertaining to this application and has summarized the material findings in the body of this report. The Board believes that the public review process has enabled the proponent to more fully identify and begin implementing its due diligence and mitigation plans. As the project is currently operating as a pilot facility, the Board is satisfied that the proponent is also developing the experience necessary to operate a commercial silica mine and production facilities. Accordingly, the Board is prepared, with the authorization of the Lieutenant Governor in Council, to approve UIS's application No. 9901 subject to the conditions in the Form of Approval (Appendix A). These conditions are intended to have regard for the public interest by directing future issues management toward the appropriate regulatory bodies and public stakeholders.

DATED at Edmonton, Alberta on 18 May 2000.

NATURAL RESOURCES CONSERVATION BOARD

Brian F. Bietz Neil McCrank Cynthia A. Langlo

APPENDIX A

THE PROVINCE OF ALBERTA
NATURAL RESOURCES CONSERVATION BOARD ACT
NATURAL RESOURCES CONSERVATION BOARD

IN THE MATTER of a project of United Industrial Services Ltd. to extract and process silica sand from its Peace River Silica Sand quarry.

APPROVAL NO 9.

WHEREAS the construction of a mine as proposed by United Industrial Services Ltd. north of the Town of Peace River is a reviewable project under s. 4(c) of the *Natural Resources Conservation Board Act* being chapter N-5.5 of the Revised Statutes of Alberta, 1990; and

WHEREAS the Natural Resources Conservation Board is prepared to grant the application by United Industrial Services Ltd. for the construction of a mine at its Peace River Silica Sand quarry, subject to the conditions herein contained, and the Lieutenant Governor in Council has given authorization, hereto attached.

THEREFORE, the Natural Resources Conservation Board hereby orders as follows:

1. The project of United Industrial Services Ltd. hereinafter called "UIS" for construction of a silica mine north of the Town of Peace River on MSL (#941817) as described in Application No. 9901 from UIS to the Board dated 12 November 1999, including supplementary submissions, including undertakings of the Applicant (including but not limited to Table 1 of this approval), is approved, subject to the terms and conditions herein contained.

2. UIS shall prepare and submit to the NRCB by 31 December 2000, a summary report on issues identified in this approval, including a brief description of the resolution or progress made towards satisfying each condition.

3. UIS shall not conduct any night time operations (22:00 – 07:00) until it demonstrates to the Board's satisfaction that the comprehensive sound level meets the night time PSL of 45 dBA at the nearest residences on either side of the Peace River.

4. UIS shall plan and implement an ongoing site groundwater monitoring program, to the satisfaction of AENV, for the dual purposes of assisting with slope stability evaluations to ensure safe mining and providing early-warning of potential impact to adjacent groundwater users. As part of the groundwater monitoring program UIS shall inform potentially affected offsite groundwater users of the planned

groundwater monitoring program and disclose to them any observed anomalies immediately following detection.

5. UIS shall, to the satisfaction of AENV, implement measures for spill control and containment including overfill protection, leak detection inspection, corrosion/weathering protection and protection against mechanical damage (such as vehicle collision) for the diesel storage tank.

6. UIS shall prepare and submit to AENV an evaluation of any potential environmental impacts to the Peace River that might be caused by its industrial wastewater discharge before this year's pre-winter discharge. The report should describe any mitigation that AENV might require and include a schedule for any future monitoring.

7. UIS shall include the active reforestation of previously forested reclaimed sites in its conservation and reclamation plan, to the satisfaction of AENV.

8. UIS shall, to the satisfaction of AENV, undertake thorough rare plant surveys of the areas to be affected by its operation, to avoid rare plants where possible and to design suitable mitigation where avoidance is not possible.

9. UIS shall, to the satisfaction of AENV, conduct biological surveys at least two years in advance of clearing to allow time to adjust mine plans of sites slated for quarrying outside of the area covered by the initial five-year mine plan.

10. UIS shall, to the satisfaction of AHRE, conduct a geotechnical assessment and stability monitoring program in advance of excavation of the Shaftesbury shale to ensure viable mine plans, precautions and practices are developed and implemented, with regard for all relevant sections of the *Mines Safety Regulations*.

11. UIS shall implement all of the measures outlined in its application.

Made at the City of Edmonton, in the Province of Alberta, this day of , 2000.

NATURAL RESOURCES CONSERVATION BOARD

TABLE 1: SUMMARY OF EIA MITIGATION COMMITMENTS

Impact	Potential Issues	Mitigation Measures
Air Quality	• point source silica plant emissions • fugitive dust emissions • vehicle emissions	• continue to collect dust generated in the dry plant in the cartridge filter. • ensure the dryer remains equipped with a 42 gigajoule propane burner, a 9.9 m^3/s fan and a 9.9 m^3/s cyclone. • cover all trucks transporting product offsite to reduce fugitive emissions during transport. • institute an air monitoring program. • ASC is willing to conduct annual emission monitoring of the dryer stack and periodic measurement of silica and nuisance particulate concentrations across the site.
Noise	• high noise levels • nuisance to residents • sensory disturbances to wildlife	• ensure all onsite staff wear hearing protection. • retain current screen of trees that separates the site from adjacent landowners, when possible. • if necessary, erect further sound barriers at the edge of the site to reduce offsite noise impact; however, efforts to reduce noise at the source(s) on site would likely be more effective. • complete noise surveys periodically after noise reduction strategies have been implemented, including after installation of new equipment and modifications to existing equipment. • an operational survey of all noise sources could be completed to direct specific noise reduction strategies. This could be combined with the occupational noise program required by the Alberta Occupational Health and Safety Act. • implementation of noise reduction strategies should eliminate residual impact.
Terrain	• small slides • large slides	• initially excavate overburden in narrow strips in Shaftesbury shale, oriented east-west. • cut a maximum height into Shaftesbury shale of 20 metres. • buttress pit walls as soon as possible, at a slope of 1.5:1. • incorporate drainage into the buttress, such as a granular drain with weeping tile, on the pit wall and base. • excavate the exposed Paddy Member sandstone, then repeat for the next strip. • construct a buttress immediately if Shaftesbury shale is unstable. • use overburden from the next excavation strip in a timely manner to fill the previous cut, flattening slopes to the minimum reclamation grade of 3:1. • monitor slopes during operations to confirm the design assumptions that are being used for the pit development and to provide advance warning of a possible landslide. The monitoring system should include a combination of slope indicators, survey monuments and piezometers. Should there be any indication of a large landslide being triggered, the buttress should be constructed immediately. • in conjunction with the exploratory drilling program, conduct a geotechnical assessment to confirm the design assumptions.
Soils	• soil erosion	• minimize active, exposed working area whenever possible and progressively reclaim/revegetate as soon as possible after resource extraction. • minimize traffic in high-risk areas such as near slopes or disturbance areas. • reduce slope grade on stockpiles and inclines. • utilize stabilizing materials such as stones (available on site) and soil organic amendments when stockpiling soil. • actively revegetate soil stockpiled over more than one season.

Impact	Potential Issues	Mitigation Measures
		• for subsoil stockpiles, mix fine- and coarse-textured materials wherever necessary to increase overall soil strength. • monitor topsoil depths in reclaimed areas annually. • actively monitor and mitigate highly susceptible microsites with intensive reclamation measures (e.g., netting, riprap, organic cover, vegetation). Monitor on an annual basis after reclamation.
Soils	• topsoil limits and degradation	• minimize active, exposed working area whenever possible and progressively reclaim/revegetate as soon as possible after resource extraction. This will minimize the time the topsoil is exposed. • minimize admixing through careful stripping and stockpiling procedures. • refrain from mixing non-calcareous and calcareous soil. • use amendments, where required, such as straw and manure in soil stockpiles to increase soil water holding capacity and soil fertility. Type of amendment depends on seasonal availability throughout progressive reclamation. • use amendments during reclamation to prevent topsoil erosion and degradation. Reclamation practices commonly used for arid soils prone to erosion in southern Alberta will be applied (e.g., crimping with straw, addition of available organic amendment such as pulp mill compost). • actively monitor and mitigate highly susceptible microsites with intensive reclamation measures (e.g., netting, riprap, organic cover, vegetation). Monitor on an annual basis after reclamation.
	• inadequate reclamation material	• use bulking amendments such as straw and manure together with salvaged topsoil to increase volume of material and improve soil water holding capacity and soil fertility. Type of amendment depends on seasonal availability throughout progressive reclamation.
	• soil compaction	• no mitigative measures expected to be required.
Vegetation	• loss of rare plant habitats on escarpment	• transplant mature plants or collect and sow seeds of affected rare plants. • install appropriate controls to minimize erosion until vegetation is established. • monitor at least once during the growing season for two years after transplanting, then again after five years to ensure the plants survived.
	• further slumping of escarpment due to top-of-slope activity	• establish minimum setbacks to reduce risk of further slope failure.
	• loss of native habitat	• progressively reclaim pits as new areas are developed. • revegetate closed pits with native grass species. • monitor annually, with soils.
	• loss of timber resource	• utilize harvested timber in local milling operations, where possible. • reforest all cleared lands with an appropriate stock type.
	• other	• a non-disturbance buffer of 40 metres (the distance between the existing water intake line and the marsh) should be established around the marsh line. • seeds should also be collected and held in reserve to plant in these areas, should transplanting not be successful. • appropriate erosion controls should be placed on the reclaimed slopes, including the sites where the little seed rice grass has been transplanted, to minimize potential erosion until vegetative ground cover has become established. • while the initial goal of reclamation will be to re-establish herbaceous ground cover to control erosion, ASC

Impact	Potential Issues	Mitigation Measures
		should re-forest each pit as soon as possible. • a vegetation specialist should inspect the transplants at least once during the growing season for two years after transplanting, then again after five years to ensure the plants survive. Should any activities associated with ASC appear to be impacting the slope near these plants, proper mitigation practices should be implemented. • Monitoring for general vegetation cover can be coordinated with soils monitoring, and should be conducted annually, at a minimum, until vegetation is established. • if a forest licensee will incorporate these areas in the silvicultural trial program, they may assist in monitoring and maintenance of the plots until they reach the free-to-grow stage. • planting with suitable aspen stock would allow development of an even aged stand similar in habitat quality to the existing stands. • surveys should include an assessment of weed populations on the sites so weed control programs can be initiated quickly if problem areas are detected. • transplant rare species from this area prior to clearing or excavating for Year 3 or 5 pits. • ensure transplanting of little seed rice grass is done by a qualified vegetation specialist. Seed should be collected from the plants prior to transplanting so that seed is available should the host plants not survive transplanting. This activity should also be done by a qualified vegetation specialist. • arrange for reforestation of reclaimed upland sites with appropriate aspen stock type. • establish minimum setback distances to minimize habitat lost through slumping. • after the pits have been reforested with the appropriate stock type, annual visits should be made in the late summer to measure the year's growth and to investigate for pest damage.
Wildlife	• displacement or destruction of breeding or overwintering wildlife species during pit clearing	• conduct clearing activity for new pits in late summer or early fall to avoid nesting periods for breeding birds, and critical overwintering period for ungulates.
	• avoidance due to sensory disturbance	• see noise. No further mitigation is required.
	• loss of wildlife habitat	• clearly mark pit boundaries before clearing begins, and restrict disturbance to this area only. • progressively reclaim pits as new areas are developed. Revegetate closed pits as soon as possible after pit development ends. • monitor for wildlife at three to four-year intervals after reclamation.
	• barriers to wildlife travel corridors	• confine development to small, previously disturbed area as per five-year plan, thereby avoiding the forest stands along the river. • develop and reclaim pits sequentially, restoring a tree and shrub corridor along the valley within five to ten years.
	• increased traffic mortality	• enforce a speed limit of 30 kph on leased property access road, and within operating area.
	• other	• the two wildlife-crossing areas will be posted with wildlife crossing signs to warn drivers of the potential risk in this area. Wildlife reflective posts could also be placed in either side of these crossing areas to help discourage

Impact	Potential Issues	Mitigation Measures
		wildlife crossings in traffic during evenings or at night. • recolonization of the reclaimed areas should also be monitored, to ensure the goal of restoring suitable wildlife habitat has been met. Breeding bird and ungulate browse and pellet surveys conducted at three to four year intervals would provide an indication of reclamation success. Alternatively a wildlife observation system, which would record observations and locations of wildlife on the site, could be used to informally monitor use of the area by wildlife species. • ASC will minimize traffic between 2100 and 0700. This will allow a quiet period and encourage wildlife movement during those times. • elimination of vehicle access to the base of the Peace River Valley. • maintenance of wildlife corridors through the site. • noise level is anticipated to be at a low and constant level during the operation, allowing wildlife to accommodate to disturbance. No further mitigation is required. • access should be restored with reclamation of the disturbed areas, provided the re-contoured slope retains an easily traversed connection with the eastern sections of the escarpment.
Surface Water	• discharge to Peace River • water withdrawal from Peace River • erosion/ sedimentation • water quality and management	• ensure surface drainage collected on site and reused. Ensure that minimal discharge is maintained. Periodic return flows will decrease TSS loads. No process chemicals to be discharged to the river. • direct surface runoff around active mining operation. Collect water within active pit and direct to settling basins. • ensure secondary containment of all chemical storage tanks. • recycle process water onsite, so only makeup water is required. Volumes withdrawn insignificant relative to base flows in the river. • collect surface water on site in pit, and direct all water to settling basins prior to release. No industrial discharge or fugitive emissions anticipated. • no impacts expected. • sampling of the retention pond prior to any discharge will ensure water quality is monitored regularly.
Groundwater	• hydrochemical changes in groundwater bearing zones, impacting water quality	• there are no practical measures to mitigate this impact.
	• increased thickness of the zone of aeration. Hydrochemical changes may alter groundwater quality	• there are no practical measures to mitigate this impact.
	• accidental spill of fuel and/or process chemicals	• follow UIS's emergency preparedness plan. • ensure secondary containment, as per Alberta regulations.

Impact	Potential Issues	Mitigation Measures
	• minimal impact on groundwater circulation regime from drainage caused by pit dewatering	• no mitigation is required.
	• change from pre-pit groundwater regime	• expected to be minimal so no mitigation is required. • develop an appropriate groundwater monitoring network, with annual drilling program. This would include groundwater surface elevation measurements and sample collection for chemical analysis (routine probability).
	• impact on other groundwater users	• provide an alternative source of water supply in the unlikely event that water wells are impacted.
	• other	• further subsurface drilling will confirm the absence or presence of a local perched water table.
Aquatic Resources	• loss of fish habitat • loss of fish productivity • changes in species composition	• impacts to fish habitat or fish production would be related to effects on the Peace River. Since no changes on flows or water chemistry are anticipated, no effects on fish or fish habitat are expected.
Land use	• loss of aesthetics	• reclaim pits progressively.
	• other	• when the ASC intends to expand their operations to the west side of the Peace River, they will consult with the MD of Northern Lights regarding re-zoning of the AG lands. • when ASC is planning on developing their lease in MD 22, they will obtain a development permit from the public lands division. At this time, they must ensure they followed the environmental standards as put forth in the MD 22 Land Use Bylaw. • ASC will apply to the MD of East Peace for a new development permit that covers full-scale operations. • ASC is committed to working with the MD of East Peace and residents to address any future conflicts that may arise.
Public Health and Safety	• respiratory ailments	• continue current mitigation measures, including cyclone filtration and an onsite dust cartridge. • conduct an air monitoring program for the site.
	• increase in traffic	• enforce speed limits at 30 kph onsite and 70 kph on truck transportation route. • ensure Kleysen Transport Ltd. follows corporate compliance, occupational safety and health policies.
	• geotechnical stability	• see geotechnical mitigation measures above. • place signage at roads and river banks to warn of the operations.
	• other	• regular alcohol and drug testing of the drivers will be implemented. • ASC is willing to measure offsite noise levels if complaints arise, following the EUB protocol. An operational survey of all noise sources could then be completed to direct specific noise reduction strategies. • currently, a screen of trees separates the site from adjacent landowners. As much as possible these trees should be retained. Further sound barriers could be erected at the edge of the site to reduce offsite noise impact; however, efforts to reduce noise at the source(s) onsite would likely be more effective.

Impact	Potential Issues	Mitigation Measures
		• noise surveys should be conducted annually and following installation of new equipment or significant modification of present equipment.
Socio-economic	• increased employment	• none required, benefit to the community.
	• positive economic conditions	• none required, benefit to the community.
	• impacts to service provider	• institute appropriate emergency response procedures. • insignificant impact anticipated given workforce is drawn from local population.
	• potential dust, aesthetic and safety issues regarding local residents	• noise mitigation measures are discussed above.
	• impacts to trapping, fishing and hunting	• place signage at locked gates to ensure recreationists are aware of operations. • signage will be placed at lease boundaries to ensure no hunters enter the property.
	• other	• ASC will continue to take an active part in local job training programs.
Historical Resources	• disturbance to archaeological resources	• plant operations on pre-disturbed site. Chances of undisturbed archaeological resources on these sites are limited. • conduct historical resource impact assessment on any undisturbed lands. • ASC will consult with an archaeologist qualified to hold an Archaeological Research Permit within the province of Alberta prior to developing previously undisturbed areas.
Waste Management		• ASC will continue to subscribe to waste reducing principles, and will analyze waste to determine opportunities for reduction, reuse and recycling. All wastes will be classified to ensure safe handling, transportation, disposal and treatment. Waste will be stored and disposed of in a manner that will reduce the risk of impact to soil, water and groundwater, as well as minimize the impact of exposure to workers and wildlife. • transportation of the waste will comply with the *Transportation of Dangerous Goods Act* and the *AEPEA Waste Control Regulation* where appropriate including manifesting requirements. • all waste storage will be regularly visually inspected to ensure proper segregation, containment and regulatory compliance.
Fugitive Emissions		strategies to mitigate fugitive emissions include the following: • operating the hot belt and dryer discharge hopper such that a constant feed of sand is discharged from the hopper. Dust is contained within the dryer and collected in the dryer's dust collection system. • enclosing the hot belt to prevent windblown fugitive emissions. • the cartridge bag for the dry plant has enough capacity that dust generated from the transfer of sand to the bucket elevator is drawn up the elevator to the dust collector. • the distance from the lower valve to the load out belt is socked to ensure the product doesn't free fall from the silo to the belt. Any dust generated is contained within the sand flow. • transfer points along belt lines are designed to impart minimum disturbance on the carried sand. ASC will monitor the performance of these transfer points and correct any fugitive emissions as warranted. • the inclined loading belt is enclosed to prevent blowing dust.

Impact	Potential Issues	Mitigation Measures
		• an accordion type expanding loading spout is fitted to the discharge end of the loading conveyor belt in order to minimize the free fall of product into open trailers and to provide a positive seal to tankers.
Public Consultation		• meetings will continue to be held with stakeholders to discuss concerns and opportunities, as appropriate. • ASC will have a minimum annual consultation with MD 131 and the Peace River Economic Development Board to ensure open lines of communication are maintained, and to provide opportunities for further input into the project. • ASC will provide the opportunity for public input at an open house after the EIA application is filed. • ASC is anticipating construction of a public conservation center on previously disturbed land on the site to educate the public on their operations, and support future conservation efforts in the community.
Reclamation		• reclamation will be completed in about September of any operation year. Replacement of topsoil and seeding will be completed before July 1st of the year following reclamation.